WARM DEFINITIONS AND ACRONYMS

1 DEFINITIONS

Aerobic Occurring in the presence of free oxygen.

Anaerobic Occurring in the absence of free oxygen.

Anthropogenic Derived from human activities.

Baseload electricity An estimate of the electricity produced from plants that are devoted to the production of baseload electricity supply. Baseload plants are the production facilities used to meet continuous energy demand, and produce energy at a constant rate. Plants that run at over 80% capacity are considered "baseload" generation; a share of generation from plants that run between 80% and 20% capacity is also included based on a "linear relationship."

Biogenic Of non-fossil, biological origin.

C&D landfill A landfill designed for and accepting only construction and demolition materials.

Carbon offset Emission savings or storage that can be considered to cancel out emissions that would otherwise have occurred. For example, electricity produced from burning landfill gas is considered to replace electricity from the grid, leading to a carbon offset because landfill gas production and combustion results in lower GHG emissions than grid electricity production from fossil fuels.

Carbon sequestration The removal of carbon (usually in the form of carbon dioxide) from the atmosphere, by plants or by technological means.

Carbon storage Prevention of the release of carbon to the atmosphere by its storage in living plants (e.g., trees) and undecayed and unburned dead plant material (e.g., wood products, biogenic materials in landfills).

Cellulose A polysaccharide that is the chief constituent of all plant tissues and fibers.

Closed-loop recycling A *recycling* process in which the primary product type is remanufactured into the same product type. (e.g., Aluminum cans recycled into aluminum cans.)

Combustion A waste management strategy in which the waste material is burned. Waste-to-energy combustion facilities are set up to produce useful heat and/or electricity.

Combustion emissions Emissions from combustion adjusted based on regional avoided utility emission factors.

Composting A waste management strategy in which aerobic microbial decomposition transforms biogenic material such as food scraps and yard trimmings into a

	stable, humus-like material (compost).
Demanufacturing	Disassembly and recycling of obsolete consumer products such as computers, electronic appliances, and carpet into their constituents in order to recover the metal, glass, plastic, other materials, and reusable parts.
Downstream emissions	Emissions that occur at life-cycle stages after use: e.g., waste management.
Embedded energy	The energy contained within the raw materials used to manufacture a product. For example, the embedded energy of plastics is due to their being made from petroleum. Because petroleum has an inherent energy value, the amount of energy that is saved through plastic recycling and source reduction is directly related to the energy that could have been produced if the petroleum had been used as an energy source rather than as a raw material input.
Emission factor	Greenhouse gas emission in metric tons of carbon dioxide equivalent per short ton of material managed.
End-of-life pathways	The end-of-life management strategies available in WARM: recycling, composting, combustion, and landfilling. Sometimes source reduction is included in this phrase, although source reduction does not occur at end of life.
Energy content	The inherent energy of a material. For example, the amount of energy in a plastic potentially available for release during combustion.
Forest carbon sequestration	As forests grow, they absorb atmospheric CO_2 and store it. When the rate of uptake exceeds the rate of release, carbon is said to be sequestered. See also carbon sequestration and carbon storage.
Fugitive Emissions	During the composting process, microbial activity decomposes waste into a variety of compounds, whose composition depends on many factors, including the original nutrient balance and composition of the waste, the temperature and moisture conditions of the compost, and the amount of oxygen present in the pile. In WARM, this process is refers to the generation of small amounts of CH_4 and N_2O.
Hemicellulose	Constituent of plant materials that is a polysaccharide, easily hydrated, and easily decomposed by microbes.
Inorganic	1. Not referring to or derived from living organisms. 2. In chemistry, any compound not containing carbon (with a few exceptions).
Landfill carbon storage	Biogenic materials in a landfill are not completely decomposed by anaerobic bacteria, and some of the carbon in these materials is stored. Because this carbon storage would not normally occur under natural conditions (virtually all of the organic material would degrade to CO_2, completing the photosynthesis/respiration cycle), this is counted as an anthropogenic sink.

	However, carbon in plastic that remains in the landfill is not counted as stored carbon, because it is of fossil origin.
Landfilling	A waste management strategy involving the anaerobic decomposition of organic substrates producing CH_4 and CO_2.
Leachate	Liquid that percolates through waste material in a landfill picking up contaminants from the waste material. Landfill leachate must be collected and properly disposed of to avoid transferring the contaminants to groundwater
Life-cycle assessment	An accounting method that evaluates and reports the full life-cycle inputs and outputs (including GHG emissions) associated with the raw materials extraction, manufacturing or processing, transportation, use, and end-of-life management of a good or service.
Loss rate	The amount of recovered material that is lost during the recycling process, relative to the total amount of collected material. The inverse of the retention rate.
Materials (or waste) management strategy	One of the five strategies in WARM: source reduction, recycling, composting, combustion, and landfilling.
Methanogenic	Biologically producing methane.
MSW landfill	A landfill designed for and accepting only municipal solid waste.
Non-baseload electricity	An estimate of the marginal electricity produced from plants that are more likely to respond to incremental changes in electricity supply and demand based on their capacity factor. All power plants with capacity factors below 20% are considered "non-baseload". Plants that run at over 80% capacity are considered “baseload” generation and not considered the “non-baseload”; a share of generation from plants that run between 80% and 20% capacity is included based on a “linear relationship”.
Open-loop recycling	A *recycling* process in which the primary product is remanufactured into other products that are different from the original primary product. (e.g., carpet recycled into molded auto parts).
Organic	1. Referring to or derived from living organisms. 2. In chemistry, any compound containing carbon (with a few exceptions).
Partial-open-loop recycling	A *recycling* process in which a portion of the primary product type is remanufactured into the same product type, while the remaining portion is recycled into other product types. e.g., corrugated containers are recycled into both corrugated containers and paperboard.
Personal Computer	For WARM's purposes, a PC is composed of a CPU, consisting of housing (mostly steel) and internal electronic components, and a cathode ray tube (CRT) monitor, consisting of the CRT, plastic case, and circuit boards. The

	peripheral equipment (e.g., keyboards, external cables, printers) are not included in WARM's analysis.
Post-consumer emissions	Emissions that occur after a consumer has used a product or material: generally, waste management emissions.
Post-consumer recycling	Materials or finished products that have served their intended use and have been diverted or recovered from waste destined for disposal, having completed their lives as consumer items. In contrast, pre-consumer recycling is material (e.g., from within the manufacturing process) that is recycled before it reaches the consumer.
Pre-combustion emissions	The GHG emissions that are produced by extracting, transporting, and processing fuels that are in turn consumed in the manufacture of products and materials.
Process energy emissions	Emissions from energy consumption during the acquisition and manufacturing processes
Process non-energy emissions	Emissions occurring during manufacture that are not associated with energy consumption, e.g., perfluorocarbons (PFCs) are emitted during the production of aluminum.
Recovery	The collection of used materials for recycling. Generally recovered materials are taken from the point of use to a materials recovery facility (MRF).
Recycled input credit	WARM calculates the recycled input credit by assuming that the recycled material avoids—or offsets—the GHG emissions associated with producing the same amount of material from virgin inputs.
Recycling	Recovering and reprocessing usable products that might otherwise become waste.
Retail transport emissions	The typical emissions from truck, rail, water, and other-modes of transportation required to transport materials or products from the manufacturing facility to the retail/distribution point.
Retention rate	The amount of recovered material that is transformed into a recycled product, relative to the total amount of collected material. The inverse of the loss rate.
Source reduction	Any change in the design, manufacture, purchase, or use of materials or products that reduces or delays the amount or toxicity of material entering waste collection and disposal. These practices include lightweighting, double-sided copying, and material reuse. It is also possible to source reduce one type of material by substituting another material.
Transportation emissions	Emissions from energy used to transport materials, including transport of manufactured product to retail/distribution point.

Upstream emissions	Emissions that occur at life-cycle stages prior to use: e.g., raw materials acquisition, manufacturing, and transportation.
Waste-to-energy facility	Municipal solid waste incinerator that converts heat from combustion into steam or electricity

2 ACRONYMS

AF&PA	American Forest and Paper Association
BBP	benzyl butyl phthalate
Btu	British thermal unit
C	carbon
C_2F_6	hexafluoroethane
$CaCO_3$	limestone
CaO	lime
CF_4	tetrafluoromethane
CH_4	methane
CO_2	carbon dioxide
DINP	diisononyl phthalate
EF	emission factor
eGRID	U.S. EPA's Emissions & Generation Resource Integrated Database
EPA	U.S. Environmental Protection Agency
FAL	Franklin Associates, Ltd.
FC	forest carbon
FRA	Forest Resources Association
GHG	greenhouse gas
GWP	global warming potential
HDPE	high-density polyethylene
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram
kWh	kilowatt-hour

lb	pound
LCA	life cycle assessment
LCI	life cycle inventory
LDPE	low-density polyethylene
LFG	landfill gas
MDF	medium-density fiberboard
MRT	mean residence time
MSW	municipal solid waste
MTCE	metric tons carbon equivalent
MTCO2E	metric tons carbon dioxide equivalent
N	nitrogen
N_2O	nitrous oxide
NAPAP	North American Pulp and Paper
NREL	National Renewable Energy Laboratory
PET	polyethylene terephthalate
PRC	paper recovery
PVC	polyvinyl chloride
PWH	pulpwood harvest
RDF	refuse-derived fuel
RMAM	raw materials acquisition and manufacturing
USDA	U.S. Department of Agriculture
USDA-FS	U.S. Department of Agriculture, Forest Service
VCT	vinyl composition tile
VOC	volatile organic compound
WARM	Waste Reduction Model
WTE	waste-to-energy